



ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

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October 7, 2019

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FloorW3.2A.581
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Wilmer Reyes
CBS Operations
20 Stanwix Street, 10th
Pittsburgh, PA 15222

Re: 0110300003 – Bureau County
New Jersey Zinc/Mobil Chemical
Superfund/Technical Reports

Operable Unit 3 – Former Plant Site Area

Dear Mr. Abel and Mr. Reyes:

The Illinois Environmental Protection Agency (Illinois EPA) has reviewed the *Baseline Ecological Risk Assessment (BERA), OU3: On-Site Soils and Groundwater (Revision 1)* dated July 2019 and received via download on July 27, 2019. The BERA was prepared by Ramboll on behalf of the DePue Group and represents a revision based on Illinois EPA's previous comments.

Pursuant to the Interim Consent Order (ICO) Section XVI, Illinois EPA provides disapproval of the revised BERA and specifies the following required modifications as described in the comments below. (Page numbers in the comments below refer to the redline strikeout copy of the revised BERA.)

The DePue Group and Illinois EPA have 30 days (until and including November 6, 2019) to informally negotiate and resolve any differences regarding required modifications. Barring this, Illinois EPA will expect a revised final BERA to be submitted no later than December 21, 2019. If any differences are not resolved by November 6, 2019 the DePue Group has until November 18, 2019 to initiate the ICO Dispute Resolution procedures.

GENERAL COMMENTS

G1. Little or no effort was made in the revised BERA to tie the risk results for the model species (e.g. American robin, short-tailed shrew, and eastern cottontail) to the assessment endpoints they represent (e.g. invertivorous birds, invertivorous mammals, and small to medium-sized herbivorous mammals, respectively). Sections 5 (Risk Characterization) and Section 6 (Conclusions) must connect the risk results for the model species to the assessment endpoints identified in Section 2.5 and Table 2-4. In general, throughout Section 5.3 (Risk Description)

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and Section 6 (Conclusions) there is too much emphasis on the model species at the expense of the assessment endpoint. These sections offer arguments regarding why risks to the model species may be overestimated or highly uncertain because of differences in body mass, sensitivity, or other characteristics between the model species and test species used for toxicity-reference-value (TRV) development. Arguments specific to the model species are not universally applicable to the assessment endpoint and may be misleading regarding the level of risk to the assessment endpoint and degree of uncertainty in the risk estimate for the assessment endpoint. Hence, such arguments should be omitted, greatly curtailed, or highly qualified in the revised BERA. The cottontail represents many other herbivorous mammals, including voles and other small species. The shrew represents other invertivorous mammals, such as moles, which are much larger than shrews. The American robin represents dozens of other invertivorous birds, including wrens, warblers, thrushes, and thrashers. These other species have different body masses than the model species and likely have different sensitivities to metals compared with the model species. Sections 5 and 6 must be revised to address this general shortcoming.

Required Modification: See comments below for specific modifications.

G2. Section 5.1 (Risk Estimation) states: *Adverse effects on a given receptor are unlikely if the HQ is less than or equal to 1 for HQs calculated from NOAEL-based TRVs, or if the HQ is less than 1 for HQs calculated from LOAEL- or EC20-based TRVs.* USEPA (1997, Section 2.3) states that a NOAEL-HQ less than one (unity) indicates that the contaminant alone is unlikely to cause adverse ecological effects. When rounding a NOAEL-HQ to one significant figure, then the decision criteria should be $HQ \geq 1$ to indicate the contaminant should be retained for further consideration or action, and $HQ < 1$ to indicate that adverse effects are unlikely and action would generally not be warranted.

In addition, there are several cases in the revised BERA where LOAEL- or EC20-HQs equal to 1 were overlooked as showing a potential for risk (e.g., zinc for mourning dove for whole Bluff Area [see Table 5-1] and zinc for deer mouse for ragweed clearings [compare total daily intake (TDI) in Table 5-2 with LOAELs in Table 4-1]). To be consistent with USEPA guidance, the same decision criterion should be used for both NOAEL-HQs and LOAEL-HQs; that is, $HQs \geq 1$ fail the screen.

Required Modification: Illinois EPA is in agreement with the DePue Group's interpretation of LOAEL- or EC20-based HQs. Revise Tables 5-1 to 5-5 (including the footnotes) and in Sections 5 and 6 to include this same decision criterion for NOAEL-based HQs. (Additional specific comments below identify areas where revisions are needed to address this general comment.)

USEPA. 1997. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. Interim Final.* U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, DC. EPA 540-R-97-006. June.

G3. A concise summary of risk results is needed in the revised BERA for review by risk managers and stakeholders. The summary should include all risk results (i.e., HQs) presented in Section 5, not only those deemed most applicable by the DePue Group. Whenever the HQ is based on an EC20 with confidence limits, the summary should present the range for the HQ based on the confidence limits. The summary should not presume that tissue-based HQs are superior to dose-based HQs when both HQ types are available for a given receptor-contaminant pair and risk results are inconsistent. Risk managers may prefer basing decisions on dose-based HQs given greater confidence in effect levels and exposure estimation methods, or basing decisions on the more protective and least uncertain HQ. A logical place to provide such a summary would be at the beginning of Section 6.

SPECIFIC COMMENTS

- 1. Section 2.4.2 (Identification of Representative Receptors), page 7, under American Robin** -- This section states that: Robins are evaluated in this BERA as a representative invertivorous bird. However, invertivorous birds are not listed as an assessment endpoint in Section 2.5. Table 2-4 of the Revised BERA lists the robin as an "omnivorous bird."

Required Modification: In Section 2.5 of the Revised BERA, within the bullet for "Survival and reproduction of birds," insert "invertivorous" as a descriptor, or describe the robin as "omnivorous."

- 2. Section 2.4.2 (Identification of Representative Receptors), page 8, under Northern Short-Tailed Shrew** -- This section states that: The short-tailed shrew is evaluated in this BERA to represent invertivorous mammals. However, invertivorous mammals are not listed as an assessment endpoint in Section 2.5. Table 2-4 of the Revised BERA lists the short-tailed shrew as a carnivorous mammal.

Required Modification: In Section 2.5 of the revised BERA, within the bullet for "Survival and reproduction of mammals," insert "invertivorous" as a descriptor, or describe the shrew as "carnivorous."

- 3. Section 4.1 (Dose-Based TRVs), page 19, 1st paragraph:** This paragraph states: *Variation among multiple results can be due to a variety of factors, such as sensitivity differences among (and sometimes within) species, exposure duration, chemical form tested, toxicity endpoint evaluated, and test conditions.* Other factors also affect the value of the no observed adverse effect level (NOAEL) and lowest observed adverse effect level (LOAEL) from a given study. Poorly designed studies with low statistical power result in higher NOAELs or LOAELs compared with more rigorous studies with higher statistical power.

Please be advised that in general and based on the lack of known occurrences of endangered or threatened species within the Bluff Area, Illinois EPA will give greater

weight to LOAEL-based HQs for risk-management decisions and on HQs calculated from the lowest identified LOAELs used in the Bluff Area BERA.

Required Modification: After this sentence, add the following text: *Variation among test results also may be the result of experimental design (i.e., doses tested), sample size (i.e., number of replicate animals per treatment group), variability within treatment groups, and the statistical procedure used to evaluate test results.*

4. **Section 4.2 (Tissue-Based TRVs), page 20, last paragraph** – This paragraph states: *To the extent that the risk estimates from these two TRVs diverge, the difference provides insight into uncertainty due to the dose-based extrapolation of toxicity data from large to small birds (i.e., from chickens to robins).*

Required Modification: Because body-weight scaling of avian TRVs was removed from the BERA, delete the last two sentences of this paragraph.

5. **Section 4.2 (Tissue-Based TRVs), pages 20 to 21, and Appendix G (Tissue-Based TRVs)** -- Cooke (2011) states that at higher doses and higher rates of absorption, critical limits are 105 to 210 mg/kg dry weight in kidney. This range is an effect range. The DePue Group treated 105 mg/kg dry weight as a NOAEL and 210 mg/kg dry weight as a LOAEL, which is incorrect. No NOAEL is available for the kidney-cadmium evaluation for the shrew. The lower value of 105 mg/kg dry weight is a conservative LOAEL and 210 mg/kg dry weight is a higher LOAEL. It is not necessary to exceed 210 mg/kg dry weight in kidney for adverse effects to be possible. Exceeding 105 mg/kg dry weight in kidney also indicates a potential for adverse effects.

Required Modification: Revise Section 4.2 and Appendix G to reflect the use of 105 mg/kg dry weight as the LOAEL-based TRV.

6. **Section 5.1 (Risk Estimation)** – This section states: *Adverse effects on a given receptor are unlikely if the HQ is less than or equal to 1 for HQs calculated from NOAEL-based TRVs, or if the HQ is less than 1 for HQs calculated from LOAEL- or EC20-based TRVs.* USEPA (1997, Section 2.3) states that a NOAEL-HQ less than one (unity) indicates that the contaminant alone is unlikely to cause adverse ecological effects. Hence, NOAEL-HQs ≥ 1 should be retained for further analysis. When rounding a NOAEL-HQ to one significant figure, the decision criterion should be $HQ < 1$ indicating that adverse effects are unlikely and action would generally not be warranted; $HQ \geq 1$ should be retained for further consideration or action.

Required Modification: Revise the text of Section 5 and Tables 5-1 to 5-5 (including the footnotes) accordingly.

USEPA. 1997. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. Interim Final*. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, DC. EPA 540-R-97-006. June.

- 7. Section 5.1.1 (Risk Description for Birds), 1st paragraph, page 21, and Table 5-1** – This paragraph states: *Initial HQs greater than 1 were indicated for American robins for cadmium in all exposure scenarios and for zinc in ragweed clearings only*. The appropriate decision criterion for an HQ based on a LOAEL TRV is $HQ \geq 1$. For the robin for zinc, the HQ is 1 for the whole Bluff Area (see Tables 5-1 and 5-4) based on an EC20 TRV; hence for this exposure scenario, a potential risk is suggested. Also, for the mourning dove, the HQ is 1 for Zn for the whole Bluff Area (see Table 5-1) based on the same EC20 TRV, suggesting that the modeled exposure is great enough to pose a risk. This problem (i.e., using $HQ > 1$ instead of $HQ \geq 1$ as a decision criterion) must be fixed throughout Section 5.

Required Modification: For example: *Initial HQs ≥ 1 were calculated for the American robin for cadmium in all exposure scenarios and for zinc in ragweed clearing and the whole Bluff Area; and for the mourning dove in the whole Bluff Area.*

- 8. Section 5.1.1 (Risk Description for Birds), bullets at bottom of page 21 – Required Modification:** Based on the previous comment and specific comments below, remove the dove and lead from this bullet list.
- 9. Section 5.1.1 (Risk Description for Birds), page 22, 2nd paragraph** – This paragraph begins with: *Because of HQs higher than 1....* As noted above, the appropriate decision criterion is $HQ \geq 1$.

Required Modification: Revise to: *Because of HQs equal to or greater than 1* and a discussion of potential risks to the mourning dove from zinc in the whole Bluff Area should be added to this section.

- 10. Section 5.1.1 (Risk Description for Birds), page 22, 2nd paragraph** – It should be noted that the study (Scheuhammer 1996) with ringed turtle doves used to develop the unbounded NOAEL (3 mg/kg/day) for cadmium was rejected by USEPA during development of the avian Eco-SSL for cadmium. Also, Scheuhammer (1996) noted that the lack of observable reproductive effects in their study may be because clutch size for ringed turtle doves typically is small (one or two eggs per clutch) even in control birds. Mean reproductive success in all treatment groups was one fledged young per reproductive pair (p. 341 in Scheuhammer 1996). For these reasons, the ringed turtle dove is not the more closely applicable model to investigate reproductive effects. Hence, it should be not assumed that HQs based on the unbounded NOAEL from Scheuhammer (1996) supersede those based on the EC20 for effects on egg production in chickens.

Required Modification: The limitations of the TRV based on Scheuhammer (1996) study should be described in this section and the following statement should be omitted: *Based on body size and egg production physiology, the dove TRV is more closely applicable to American robins than the chicken TRV.*

- 11. Section 5.1.1 (Risk Estimation for Birds), page 22, last paragraph of section –** This paragraph states the following: *The initial HQs for robins exposed to zinc are less than or equal to 1 for the whole Bluff Area and forest/grassland areas and 2 for ragweed clearings. These HQs are calculated using an EC20 for zinc effects on egg production in chickens.* When the TRV is an effect level (EC20 in this case), the decision point should be $HQ < 1$ to conclude that a risk is unlikely. $HQ = 1$ implies an effect threshold has been reached. For the ragweed clearings (HQ 2) and whole bluff area (HQ 1), zinc exposure for the robin (representing the omnivorous bird assessment endpoint) is great enough to affect reproduction.

Required Modification: Delete “equal to” from this sentence. The description of the risk results should be corrected accordingly (i.e., the zinc HQ is 1 for the robin for the whole Bluff Area based on an EC20 TRV, implying that zinc exposure is great enough to affect reproduction).

- 12. Section 5.1.2 (Risk Estimation for Mammals), page 22 at bottom –** This section states: *The finding of no risk to deer mice is consistent with a study of white-footed mice inhabiting a wetland constructed using dredged material from DePue Lake, where concentrations of cadmium, lead, and zinc in soil are similar to those found in the Bluff Area (Levengood and Heske 2008).* This is a poor comparison. No information is available on the bioavailability of metals in Bluff Area soils compared to soils in the Lake DePue area.

Required Modification: Omit this comparison. Also, as noted elsewhere in these comments, the revised BERA does not support the conclusion of “no risk” to the deer mouse.

- 13. Table 5-2 (Initial Dose Based HQs for Ragweed Clearings) –** For the deer mouse for zinc, the total daily intake (TDI, 79 mg/kg/day) exceeds the NOAEL TRV (75.4 mg/kg/day; $HQ = 1$) and marginally exceeds the rat EC20 for weanlings per female (78.7 mg/kg/day; $HQ = 1$). Also, $HQ = 1$ when the LOAEL of 81.1 mg/kg/day is used in the risk calculation, suggesting that zinc exposure for the deer mouse (and other omnivorous small mammals) has reached a level of concern in the ragweed clearings.

Required Modification: Acknowledge these results in Section 5.1.2. Add a table for the deer mouse similar to Tables 5-4 to 5-6 for the robin, shrew, and cottontail.

14. Section 5.1.2 (Risk Estimation for Mammals), bullets at bottom of page 22 –

Required Modification: For reasons described above, the deer mouse should be removed from this bullet list.

15. Section 5.2.1 (Uncertainties in the Exposure Assessment), page 25, 1st full paragraph regarding robin diet – The robin diet was assumed to be 46% above-ground invertebrates, 46% litter invertebrates, and 8% berries for this BERA (see Table C-13). This is a realistic diet for breeding adults and developing chicks, which are sensitive life stages; therefore, this diet is not unduly conservative as implied by the discussion in 5.2.1. It could be argued that the assumed diet was not adequately conservative because it included berries, which have lower contaminant levels than invertebrates. Illinois EPA also notes that this BERA does not include an assessment endpoint for strictly invertivorous birds (e.g., many species of wrens and warblers, woodcock, etc.). The assumed robin diet (92% invertebrates and 8% berries) allows the robin to reasonably represent invertivorous birds as well as omnivorous birds during the breeding season, when such birds consume mostly invertebrates.

Required Modification: Either delete this paragraph (preferable) or significantly revise it to describe the suite of species that the robin represents and that the assumed diet is appropriate.

16. Section 5.2.2 (Uncertainties in the Effects Assessment), 4th paragraph. page 27 -- This paragraph states: *Also, few small mammal reproductive studies with zinc have included treatments that spanned both no-effect and effect concentrations, such that identification of a mammalian Eco-SSL LOAEL for zinc based on the lowest bounded LOAEL would have resulted in a large gap between the Eco-SSL NOAEL and LOAEL TRVs and a high degree of uncertainty in interpreting zinc exposures. Instead, an unbounded LOAEL was used for this purpose, but this choice also entails uncertainty; in studies with multiple treatment groups it is possible to discern non-dose-related variability, whereas such “noise” cannot be distinguished from dose-related effects in studies with only one treatment level, such as the study selected to represent the Eco-SSL LOAEL for zinc (Barone et al. 1998).* In general, the arguments presented here are weak. The range of unbounded LOAELs for zinc from the Eco-SSL report are informative and collectively provide useful information on the effect threshold for small mammals for zinc. These LOAELs range from 81 mg/kg/day (rat reproduction; number of progeny [Barone et al. 1998]) to 424 mg/kg/d (rat reproduction; progeny weight [Schlicker and Cox 1968]). The LOAEL of 81 mg/kg/day from Barone et al. (1998) is only 8% greater than the Eco-SSL NOAEL and similar to the EC20 of 78.7 mg/kg/day (rat reproduction, weanlings per female) developed by Ramboll. Overall, this information suggests that the effect threshold for small mammals for zinc is in the range of 78.7 to 81 mg/kg/day. The quoted text overstates the uncertainty in the effect threshold for zinc for small mammals and disadvantages associated with using unbounded LOAELs in this case.

Required Modification: Omit the quoted argument regarding zinc and small mammals.

- 17. Section 5.2.2 (Uncertainties in the Effects Assessment), page 28, 2nd paragraph from bottom** – This paragraph states: *The major limitation of the tissue residue approach is that it cannot be applied to all of the species and metals of interest (Sappington et al. 2011).* The previous sentence (“*In this BERA...*”) is an adequate summation. Either delete the sentence that begins “*The major limitation...*”, or revise by adding the text below.

Required Modification: Include as the last sentence in this paragraph: *Another important limitation is that no tissue residues were directly measured for this BERA; all were modeled using relationships from the literature for different sites and/or species where contaminant form, bioavailability, and bioaccumulation may differ compared with the Bluff Area.*

- 18. Section 5.3 (Risk Description), page 30, 1st paragraph regarding total vs. exchangeable metals** – This paragraph states: *Outliers were removed prior to generating the regression equations for cadmium and zinc and are not shown in Figure 5-1.* How many outliers were there and how great an effect did they have on the relationships shown in Figure 5-1?

Required Modification: Include the information in this section.

- 19. Section 5.3 (Risk Description), page 30, 1st paragraph regarding adjustment to cadmium mouse based LOAEL of 2.7 mg/kg/day** – This modification was not discussed with Illinois EPA.

Required Modification: Delete.

- 20. Figures 5-2 (HQs for American Robin for Ragweed Clearings and Forest/Grassland Area), 5-5 (for short-tailed shrew) and 5-9 (for eastern cottontail)** – Required modification: For completeness, these figures should include HQs for the whole bluff area.

- 21. Section 5.3.1 (Risk Description for Birds), pages 30 to 31** – The following comments pertain to this section:

- The 1st paragraph of this section (on page 30) states: *As described in Section 5.1, initial risk estimates indicate that red-tailed hawks, mourning doves, and wild turkeys are not at risk of adverse effects due to metals in the Bluff Area.* This statement is not accurate. The TDI for zinc for the mourning dove (69 mg/kg/day, see Table 5-1) marginally exceeds the initial avian TRV for zinc (68.2 mg/kg/day, HQ = 1, see Table 5.1), which is an EC20 (see Tables 4-1 and F-6), suggesting that an adverse effect is possible. Omit

mourning doves from the quoted sentence and discuss potential risks to the mourning dove and other granivorous birds in Section 5.3.1.

- This section states (on page 30): *...the most applicable TRV to robins is from the dove toxicity study by Scheuhammer et al. (1996)...* As noted above, the Scheuhammer (1996) study with ringed turtle doves is not without shortcomings. Hence, it cannot be assumed that HQs based on the unbounded NOAEL from Scheuhammer (1996) supplant those based on the EC20 for effects on egg production in chickens. The HQs based on the latter TRV cannot be disregarded when drawing conclusions about potential risks to the American robin (and other invertivorous and omnivorous birds).
- This section (or other appropriate section) should acknowledge the confidence intervals around the cadmium and zinc EC20s for birds (see Table 4-1) and discuss how the uncertainty in the EC20 influences the risk estimates for birds. For example, for the mourning dove for cadmium, the TDI (0.87 mg/kg/day, see Table 5-1) for the whole Bluff Area exceeds the lower bound on the EC20 (0.77 mg/kg/day, see Table 4-1), suggesting that an adverse impact to the dove (and other granivorous birds) from cadmium is possible (HQ = 1.1). In addition, 95% confidence intervals should be included in the revised BERA and used to demonstrate the uncertainty in the EC20s and HQs based on the EC20s.
- This section states (on page 31): *The spatial distribution of cadmium exposures compared to applicable risk-based concentrations for robins is shown in Figure 5-3; it can be seen that there are no cadmium concentrations in surface soil that exceed the tissue-based RBC.* Revise this to state that a large number of locations exceed the dose-based RBCs, especially the dose-based RBC based on the EC20 for egg production in chickens (green and yellow symbols in Figure 5-3).
- The last paragraph of Section 5.3.1 (on page 31) states: *Figure 5-4 shows the spatial extent of estimated zinc-related exposure to robins if using chicken as a comparison in the Bluff Area.* The wording of this sentence is cumbersome. Restore the original wording, or revise to: *Figure 5-4 shows locations where zinc levels in surface soil exceed the RBC for zinc for the American robin.*
- This section should indicate that potential risks to the American robin (and other invertivorous and omnivorous birds) and mourning dove (and other granivorous birds) from cadmium and/or zinc cannot be ruled out based on the results of this BERA. Inconsistent lines of evidence and uncertainties must be fairly and evenly described for consideration by risk managers and for transparency. Revise Section 5.3.1 accordingly.

22. Section 5.3.2 (Risk Description for Mammals), 1st paragraph, page 31 – This section states: *The finding of no risk to deer mice is consistent with a lack of adverse effects on*

the white-footed mouse population living on habitat constructed from dredged material from DePue Lake, where concentrations of cadmium, lead, and zinc in soil are similar to those found in the Bluff Area (Levengood and Heske 2008). As discussed previously during the BERA process for this site, comparisons between the Bluff Area and DePue Lake regarding metals bioavailability are not appropriate.

Required Modification: Omit the comparison. Also, as noted elsewhere in these comments, the revised BERA does not support the conclusion of no risk to the deer mouse.

Levengood, J.M. and E.J. Heske. 2008. Heavy metal exposure, reproductive activity, and demographic patterns in white-footed mice (*Peromyscus leucopus*) inhabiting a contaminated floodplain wetland. *Science of the Total Environment* 389:320-328.

- 23. Section 5.3.2 (Risk Description for Mammals), 2nd paragraph regarding cadmium, page 31** – This section states: *However, shrews are known to be less sensitive to cadmium than mice when subjected to acute exposures (Shore and Douben 1994), and this lower sensitivity likely extends to chronic exposures, at least to some degree.* The last part of this sentence is speculation. Mechanisms of acute and chronic toxicity typically differ; hence, it cannot be claimed that that relative sensitivities between species for acute exposure extends to chronic exposures.

Required Modification: Omit such speculation from Section 5.3.2.

Shore, R.F., and P.E.T. Douban. 1994. The ecotoxicological significance of cadmium intake and residues in terrestrial small mammals. *Ecotoxicology and Environmental Safety* 29(1):101–112.

- 24. Section 5.3.2 (Risk Description for Mammals), 2nd paragraph regarding cadmium, page 31, and Figures 5-5 and 5-6** – This section states the following: *Estimated tissue exposures fall in the uncertain range between NOAEL and LOAEL TRVs, for the ragweed clearings scenario.* Cooke (2011) states that at higher doses and higher rates of absorption, critical limits are 105 to 210 mg/kg dry weight in kidney. As noted above, this range is an effect range. The DePue Group treated 105 mg/kg dry weight as a NOAEL and 210 mg/kg dry weight as a LOAEL, which is incorrect. No NOAEL is available for the kidney-cadmium evaluation for the shrew. The lower value of 105 mg/kg dry weight is a conservative LOAEL and 210 mg/kg dry weight is a higher LOAEL. It is not necessary to exceed 210 mg/kg dry weight for adverse effects to be possible. Exceeding 105 mg/kg dry weight in kidney also indicates a potential for adverse effects. The conservative LOAEL is exceeded in the ragweed clearings, suggesting that a risk of adverse effects is possible. Revise Section 5.3.2 accordingly.

Cooke, J.A. 2011. Cadmium in small mammals. In: Beyer, W.N., and J.P. Meador (Eds.). *Environmental Contaminants in Biota: Interpreting Tissue Concentrations*, 2nd Edition. CRC Press, Boca Raton, FL. pp 627-642.

- 25. Section 5.3.2 (Risk Description for Mammals), 2nd paragraph regarding cadmium, page 31** – This section states: *Given the tissue-based risk estimates and the lower sensitivity of shrews to cadmium compared to mice, adverse effects of cadmium on shrews in forest and managed grassland areas are considered unlikely.*

Required Modification: As requested above, omit speculation about differences in cadmium sensitivity among species based on acute exposure studies. It should be noted that the LOAEL of 2.7 mg/kg/day is exceeded in the forest and managed grassland areas (HQ 1.1; see Table 5-5 and Figure 5-5). Because this LOAEL is an EC78 for the F2 generation, potential effects to invertivorous small mammals are likely in this area. Revise accordingly.

- 26. Section 5.3.2 (Risk Description for Mammals), 3rd paragraph regarding lead and shrews, page 32** – This paragraph states: *The calculation of a lead exposure estimate for ragweed clearings that exceeds a NOAEL TRV is due to conservative model inputs, such as (1) not accounting for body weight differences between the rats used in toxicity studies versus the shrews being assessed in the BERA, and (2) estimating the soil lead concentration as the 95% UCL on the mean lead concentration, rather than the arithmetic mean. If either of these inputs were adjusted, all lead HQs would fall below 1 (see Section 5.2.1). Thus, the probability that lead exposures in ragweed clearings actually reach the level estimated is very low, and adverse effects of lead on shrews are considered unlikely.* This reasoning is questionable and should be omitted. As discussed elsewhere in these comments: (1) body-weight scaling of TRVs is not recommended by USEPA in ecological risk assessments and (2) using the straight arithmetic average is not consistent with guidance and is considered inappropriate. These approaches do not constitute overly conservative modeling inputs. The BERA results suggest that lead exposure in ragweed clearings has reached a level of concern for invertivorous small mammals (LOAEL-HQ is 1; see Table 5-5); however, for the Bluff Area as a whole, lead exposure does not appear to be a concern for invertivorous small mammals (LOAEL-HQ is 0.5).

Required Modification: Acknowledge possible lead risks to invertivorous mammals in ragweed clearings based on the dose-based HQ for the shrew.

- 27. Section 5.3.2 (Risk Description for Mammals), 4th paragraph regarding the shrew and zinc, page 32** – Near the end of this paragraph, the estimated zinc dose for shrews in ragweed clearings is given as 256 mg/kg/day. Table 5-5 lists 266 mg/kg/day for the estimated exposure for the shrew in ragweed clearings.

Required Modification: Correct the value given in this paragraph.

- 28. Section 5.3.2 (Risk Description for Mammals), 4th paragraph regarding the shrew and zinc, page 32** – This paragraph states: *The estimated HQs indicate a risk of adverse effects on shrew reproduction due to zinc in ragweed clearings, and a lack of such risk*

outside the ragweed clearings. For the Bluff Area as a whole, the HQs presented in Table 5-5 indicate that the estimated zinc exposure for the shrew (109 mg/kg/day) has exceeded a level of concern (81.1 mg/kg/day, LOAEL-HQ is 1.3).

Required Modification: Revise accordingly in text and tables.

29. Section 5.3.2 (Risk Description for Mammals), 4th paragraph regarding the cottontail, page 32 – The paragraph states: *For cottontails, the body weight adjusted zinc dose from the Newman et al. (2002) study noted above would be 143 mg/kg-day, compared to an estimated daily intake from ragweed clearings of 270 mg/kg-day. Thus, reproductive failure would be possible if cottontails feed exclusively from ragweed clearings and are as sensitive to zinc as rats. Because both of these assumptions are uncertain, the actual likelihood and magnitude of predicted effects on cottontails is also uncertain.* In general, throughout the risk description section, there is too much emphasis on the model species at the expense of the assessment endpoint; in this case, herbivorous small to medium-sized mammals. The TRV scaling argument presented here may apply to the cottontail, but not to herbivorous small mammals, such as voles, that likely use the Bluff Area and are included in this assessment endpoint. Arguments specific to the model species are not universally applicable to the assessment endpoint and may be inaccurate regarding the level of risk to the assessment endpoint and level of uncertainty in the risk estimate. Putting too much focus on the model species creates the impression that the resulting HQs are too uncertain to draw a conclusion regarding risk for the assessment endpoint.

Required Modification: Such arguments should be omitted.

30. Section 6 (Conclusions), 2nd bullet – This bullet states: *Wildlife is not expected to be adversely affected by metal exposures in forest and managed grassland areas (i.e., utility corridor) within the Bluff Area.* Table 5-5 shows a cadmium dose-based HQ of 1 for the shrew based on mouse LOAEL (EC78 for reproduction for F2 generation). The tissue-based HQs for the shrew for cadmium were < 1 (HQ 0.5 and 0.3 for conservative and high LOAELs, respectively); however, this does not mean that the results of the dose-based analysis can be ignored. A similar situation exists for the American robin. This bullet should acknowledge the inconsistent lines of evidence for these two receptors for cadmium in forested/grassland areas for consideration by risk managers and for transparency. It should not be presumed that tissue-based HQs are superior to dose-based HQs when both HQ types are available for a given receptor-contaminant pair. Illinois EPA intends to base its decisions on dose-based HQs given the greater confidence in effect levels and exposure estimation methods, and because doing so is more protective.

This bullet also states: *This finding is consistent with a lack of adverse effects observed in previous published studies of wildlife living in habitat constructed using dredged material from*

DePue Lake. As noted elsewhere in these comments, comparisons between the Bluff Area and DePue Lake regarding metals bioavailability are not appropriate. Omit the comparison. Also, as noted elsewhere in these comments, the revised BERA does not support the conclusion of no risk to the deer mouse.

- 31. Section 6 (Conclusions), 3rd bullet** – This bullet states: *Within the ragweed clearings, short-tailed shrews and eastern cottontails might be adversely affected by exposures to cadmium and zinc. This finding is particularly uncertain for shrews, with respect to both the likelihood and magnitude of predicted effects.* The conclusions should focus on the assessment endpoint, not the model species.

Putting the focus entirely on the model species creates the impression that the resulting HQs are too uncertain to draw a firm conclusion regarding risk to the assessment endpoint. The cottontail represents many other herbivorous mammals, including voles and other smaller species. The shrew represents other invertivorous mammals, such as moles, which are much larger than shrews. These other species have different body masses than the model species and likely have different sensitivities to the contaminants compared with the model species.

Required Modification: Add the following text or something similar: *Overall, the BERA suggests that invertivorous and herbivorous small to medium-sized mammals may be at risk from exposure to cadmium and zinc in the Bluff Area, with the greatest potential for risk in the ragweed clearings.*

- 32. Section 6 (Conclusions), 4th bullet** -- The bullet should acknowledge the potential risks to omnivorous and/or invertivorous songbirds from cadmium based on the results for the American Robin. Table 5-4 reports HQs ≥ 1 for the robin for the whole bluff, ragweed clearings, and forest/grassland area for cadmium based on an EC20 for egg production. The tissue-based HQs were < 1 for the robin for cadmium; however, this does not mean that the results of the dose-based analysis can be ignored. Inconsistent lines of evidence should be described for consideration by risk managers and for transparency. To be health protective, IEPA likely will base risk-management decisions on the dose-based HQs. And as noted above, the risk conclusion should focus on the assessment endpoint, not the model species.

Also, this bullet states: *However, by analogy to cadmium (for which additional lines of evidence are available), the chicken-based analysis is believed to overestimate zinc-related risks to robins.* This statement is speculation and should be omitted.

- 33. Section 6 (Conclusions), 5th bullet** – As noted above, risk conclusions should focus on the assessment endpoint. Table 5-1 lists an HQ ≥ 1 for the mourning dove for zinc for the whole Bluff Area based on an EC20 for egg production. Hence, the dove should be

omitted from this bullet, and an additional bullet should be added regarding potential risks to herbivorous (granivorous) birds from zinc.

A similar situation exists for the deer mouse for the ragweed clearings. Specifically, Table 5-1 lists an $HQ \geq 1$ (the appropriate decision criterion) for the deer mouse for zinc in the ragweed clearings based on an estimated total daily intake (TDI) of 79 mg/kg/day and Eco-SSL NOAEL of 75.4 mg/kg/day. An $HQ \geq 1$ also is obtained when this TDI is divided by either LOAEL (81.1 mg/kg/day or 78.7 mg/kg/day) from Table 4-1. It should be noted that the TRV materials provided to Illinois EPA in May 2018 listed 75.9 mg/kg/day as the LOAEL for Zn for small mammals. Using this LOAEL also results in an $HQ \geq 1$ ($79/75.9 = 1$) for the deer mouse for zinc. These results suggest that exposure of the deer mouse to zinc in the ragweed clearing has reached a level of concern.

Required Modification: Omit the deer mouse from this bullet, and add an additional bullet stating that there is a likely risk to omnivorous small mammals from zinc.

34. Section 6 (Conclusions), 6th bullet – Lead should be omitted from this bullet. Table 5-5 lists a LOAEL HQ of 1 for the shrew for lead. Section 5.3.2 offers reasons why lead may not pose a risk to the shrew; however, the reasons discussed in that section are not universally applicable to all species included in the assessment endpoint and/or are based on approaches that are not considered appropriate in the ecological risk assessment arena.

Required Modification: A separate bullet stating that there is a likely risk to invertivorous small mammals from lead should be added to Section 6.

If you have any questions or wish to discuss these comments, please contact me at 217-785-2891 or at Charlene.falco@illinois.gov.

Sincerely,



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